Goddard Procedural Requirements (GPR)

DIRECTIVE NO.	GPR 8834.1B	**APPROVED BY Signature:**	*Original signed by Arthur F. Obenschain for*
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EXPIRATION DATE:	September 29, 2014	**TITLE:**	Director

COMPLIANCE IS MANDATORY

Responsible Office: 540/Mechanical Systems Division

Title: Lifting Operations Requirements

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PREFACE

P.1 PURPOSE

The purpose of this GPR is to define the process, requirements, and responsibilities for conducting safe lifting operations at Goddard Space Flight Center (GSFC).

P.2 APPLICABILITY

a. This directive is applicable to all operations associated with Lifting Devices and Equipment (LDE), including rented or leased LDE and LDE provided by on-site Support Services Contractors to the extent provided in their contracts, at Greenbelt, Wallops Flight Facility (WFF), and other areas under GSFC cognizance unless specifically excluded by this directive. It also applies to institutional lifts and manual lifts.

b. This directive does not apply to tenants and their contract personnel operating in facilities exclusively used for non-NASA operations and controlled by the tenant under a Center-level agreement provided NASA personnel are not placed at risk.

c. When invoked as a contractual requirement by the applicable project, this directive is applicable to the extent specified in the contract for off-site contractor installations supporting GSFC activities.

d. Lifting operations under privatization clauses shall be subjected to the provisions of this directive to the extent provided by the contract, and the requirements shall be clearly specified therein.

e. The responsible Contracting Officer and the Project Manager shall apply requirements of this directive to any contractor, tenant, or customer if non-NASA lifting operations place NASA personnel, facilities, or equipment at risk.

f. This directive does not apply to contractor lifting operations using contractor-provided LDE which are exclusively associated with facility construction activities where the activities take place exclusively within an area to which access by the general population of NASA employees is excluded.

P.3 AUTHORITY

NASA-STD-8719.9, Standard for Lifting Devices and Equipment

P.4 REFERENCES

a. NPR 8715.3, NASA General Safety Program Requirements
b. GPR 1400.1 Waiver Processing
c. GPR 1410.2, Configuration Management
d. GPR 5330.1, Product Processing, Inspection and Test
e. GPR 8621.1, Reporting of Mishaps and Close Calls
f. GPR 8719.1, Certification and Recertification of Lifting Devices and Equipment
g. GSFC WM-001, Workmanship Manual for Electrostatic Discharge (ESD) Control
h. GSFC Form 23-60, Task Safety Analysis Worksheet
i. NASA-STD-8719.9, Standard for Lifting Devices and Equipment
j. Department of Health and Human Services (DHHS)/National Institute for Occupational Safety and Health (NIOSH) Publication No. 94-110, Applications Manual for the Revised NIOSH Lifting Equation
k. OSHA 1910.135 (a)(1), Head Protection
l. ASME B30.23, Personnel Lifting Systems

P.5 CANCELLATION

GPR 8834.1A, Lifting Operations Requirements

P.6 SAFETY

Safety requirements are described throughout this GPR.

P.7 TRAINING

Supervisors shall ensure that:

a. Personnel involved in manual lifts are trained or briefed on proper lifting techniques;
b. All individuals designated to participate in a lifting operation are qualified to perform their role safely and effectively, based on training, prior experience, and physical ability to do the operation. This includes designated observers, safety representatives, LDE operators, communicators, and all other participants; and

c. LDE Operators are trained and certified in accordance with GPR 8719.1 for the type of lifting operations required, and that training and certifications are current.

P.8 RECORDS

Record Title	Record Custodian	Retention
Critical Lift Procedure(s)	Project Office	* NRRS 8/103: Temporary. Destroy/delete between 5 and 30 years after program/project termination.
Completed checklists	Project Office	* NRRS 8/103
Stress/Stability Analyses	Project Office	* NRRS 8/103
Variances/Waivers	Project Office	* NRRS 8/103
User documents (e.g., technical interface information, analyses, problem records, and other relevant lift-specific information	Project Office	* NRRS 8/103
Audit results (see P.9 Metrics) and corrective actions	Applicable Safety Office	* NRRS 8/103
RECERT follow-up actions to metrics	RECERT	* NRRS 8/103

**NRRS – NASA Records Retention Schedules (NPR 1441.1)*

Contractors generating records as required by this procedure shall retain the records and turn them over to NASA as specified in the contract.

P.9 METRICS

Safety organizations shall, on an annual basis, audit an appropriate number of executed lift procedures (and associated documentation) of different projects and activities under their cognizance for compliance with this Directive. Each applicable safety office shall determine which procedures to audit, such that the audit results will, in their judgment, give good representation of typical lift activities. Audit results shall be analyzed by the safety organization for continual improvement. Corrective actions shall be implemented by the affected project/organization, and tracked to closure by the safety organization. Audit results shall be submitted to the Recertification Program (RECERT) Manager for appropriate follow up actions, such as trend analysis, lessons learned dissemination, and directive revision.

P.10 DEFINITIONS

Most of the terms used in this directive are defined in NPR 8715.3, NASA-STD-8719.9, and GPR 8719.1. Those that are unique or essential to this directive are listed below.

a. Certified – An individual who has documented evidence that he/she has completed required training, and has specific knowledge or proficiency in a skill that has been demonstrated, documented, and approved by an accepted authority. Certification expires after a specified time period and must be renewed to remain current. Certification, in the context of this GPR, requires approval by the RECERT Manager.

b. Critical Hardware – Hardware whose loss would have serious programmatic or institutional impact, and has been identified by the directorate, or project as being critical.

c. Critical Lift Coordinator (CLC) – An individual who is assigned to direct and give instructions to the crane operator during critical crane operations due to specific project requirements, and who has obtained the necessary training and is certified by the RECERT Manager. The CLC is an optional position, used only when a project desires to have its own lifting expert. The role of the CLC shall be specified in the Critical Lift Procedure.

d. Critical Lift Procedure – A specific step-by-step procedure to be followed by the lift team to perform a Critical Lift operation. The procedure also defines the roles and responsibilities of all lift team members, and pertinent items to be verified prior to the lift. See Section 3.3.

e. Customer – A non-NASA, government or private sector entity or organization that owns, sponsors, or otherwise champions a project brought onto GSFC property by a current NASA contractor exercising a contractual provision permitting such an arrangement for the purposes of utilizing NASA facilities and/or test equipment on a lease or rental basis.

f. Flight Hardware – Hardware designed and fabricated for ultimate use in a vehicle intended to fly.

g. Hazardous Operating Procedures (HOP) – Detailed, documented procedures listing step-by-step functions or tasks to be performed on a system or equipment to ensure safe and efficient operations. A HOP may address such topics as special precautions, start and stop times or conditions, necessary sequences of steps, approving official(s), etc.

h. Institutional Lift – A lift performed as part of the day-to-day operations of the Center, such as lifting a section of pipe or moving a pallet of office supplies. It is not a manual lift, although a manual lift may be included as part of an institutional lift. NOTE: an Institutional Lift can also be classified as "critical," depending on the hardware involved.

i. LDE Certification – The documented status of LDE that a set of requirements have been and continues to be met. As used in this GPR, certification and recertification is a process performed by the RECERT Manager that leads to the initial, or continuation of, certification that LDE is safe to use within specific certification parameters, and includes, but is not limited to, LDE compliance and documentation reviews, tests, inspections, nondestructive testing, and analyses.

j. LDE Operator Certification – The documented status of LDE operators validating that they are trained and qualified in accordance with NASA-STD-8719.9 and GPR 8719.1, and certified by the RECERT Manager at Greenbelt or the Deputy RECERT Manager at Wallops.

k. Lift Analysis – Analysis performed to determine the maximum load the LDE is expected to experience during the worst case lift.

l. Lift Categories – The category of lifting operations determines the number and qualifications of personnel involved, documentation requirements, and safety requirements. The following categories of lifts are addressed:

(1) Critical Lift – A lift where failure/loss of control could result in loss of life, loss of or damage to critical hardware, or other items such as spacecraft, one-of-a-kind articles, or major facility components whose loss would have serious programmatic or institutional impact. Operations involving the lifting of personnel with a crane, and lifts where personnel are required to work under a suspended load, shall always be defined as critical lifts (see NASA-STD-8719.9). Operations with special personnel and equipment safety concerns beyond normal lifting hazards shall also be designated as critical. See Appendix C for a "Process for Lifting Category Determination."

(2) Non-Critical Lift – A lift involving routine lifting operations governed by standard industry rules and practices except as supplemented with unique NASA testing, operations, maintenance, inspection, and personnel licensing requirements contained in NASA-STD-8719.9 and this directive.

m. Lifting Devices and Equipment (LDE) – The collective term that includes both Lifting Devices (LD) and Lifting Equipment (LE). LDs are machines such as overhead and gantry cranes (including top running, monorail, underhung, and jib cranes), mobile cranes, derricks, gantries, hoists, winches, special hoist-supported personnel lifting devices, Hydra Sets, mobile aerial platforms, powered industrial trucks, and jacks. LE includes the slings and sling assemblies, strongbacks, shackles, load-measuring devices, and hardware components used to attach the load(s) to the lifting device(s).

n. Manual Lift – A lift where a person lifts, holds, and/or moves an item.

o. Mechanical Lift – A lift that employs the use of equipment (e.g., crane, chain fall, fork lift, etc.) to raise, lower, or move loads.

p. Off Load Operation with Constraints (OLOC) – A handling operation where LDE is used to relieve a portion of the weight of a constrained load, i.e., a piece of hardware or an item to be lifted, due to the impossibility of safe blocking or support of the load from the ground or floor. An example would be off-loading the weight of a piece of hardware attached to a handling/holding fixture (i.e., constrained) prior to releasing the attachment fasteners. See Section 2.6, Special Requirements for OLOC.

q. Person in Charge (PIC) – The individual designated by the Lifting Service User to be in charge of the operation. .

r. Personal Protective Equipment PPE) – Safety equipment such as hard hats, goggles, steel-toed shoes, etc.

s. Pre-lift Briefing – A briefing of involved personnel held prior to the commencement of a critical lift or other designated lift.

t. RECERT – An established GSFC process that provides certification and recertification expertise, management, and oversight for lifting devices and equipment at GSFC or by GSFC contractors (see P.2). The RECERT manager has overall responsibility for RECERT functions. The processes of certification/recertification of LDE and operators are described in GPR 8719.1.

u. Rigger – An individual who selects and attaches lifting equipment to an item to be lifted. At GSFC, a rigger is a certified LDE operator.

v. Safety Representative – An individual who is selected to make judgments concerning personnel, equipment, or systems safety. The safety representative shall be qualified on the basis of a certificate, professional standing, and/or demonstrated competence in the types of lifts they take part in. The Safety Representative shall be selected by mutual agreement of the Lifting Service Provider (LSP) and User, who together determine the necessary qualifications for the assigned task. The applicable safety organization (Safety and Environmental Division, Systems Reliability and Safety Office, or the Wallops Safety Office) shall concur with or deny the selected Safety Representative.

w. Tenant – A non-NASA entity or organization that has obtained GSFC's permission to reside on Center. The entity or organization has total control of, and responsibility for, its own operations and activities within the agreed-upon boundaries, as long as NASA personnel or property are not put at risk.

x. Waiver/Variance – Written authorization to depart from a specific requirement.

P.11 ACRONYMS

ASME	American Society of Mechanical Engineers
CLC	Critical Lift Coordinator
CG	Center of Gravity
CMS	Constant Micro Speed
DHHS	Department of Health and Human Services
DOT	Department of Transportation
EED	Electro-Explosive Device
ESD	Electrostatic Discharge
FOM	Facility Operations Manager

GSFC	Goddard Space Flight Center
HOP	Hazardous Operating Procedures
LD	Lifting Device
LDE	Lifting Devices and Equipment
LE	Lifting Equipment
LSP	Lifting Service Provider
NIOSH	National Institute for Occupational Safety and Health
OEM	Original Equipment Manufacturer
OLOC	Off Load Operation with Constraints
OSHA	Occupational Safety and Health Administration
PIC	Person In Charge
PPE	Personal Protective Equipment
QA	Quality Assurance
RECERT	Recertification Program
SWL	Safe Working Load
WFF	Wallops Flight Facility
WOA	Work Order Authorization

PROCEDURES

In this document, a requirement is identified by "shall," a good practice by "should," permission by "may" or "can," expectation by "will" and descriptive material by "is."

This directive establishes GSFC requirements for lifting operations. It complements NASA-STD-8719.9 to ensure the safety of all personnel and equipment involved in lifting operations at all levels of complexity.

For use at a contractor's facility, the requirements of this directive may be tailored and reissued as a project document and controlled in accordance with GPR 1410.2, and invoked in the applicable contract(s).

1.0 RESPONSIBILITIES

1.1 Lifting Service Provider (LSP)

The LSP is the organization that provides a lifting service to a user, and is usually the owner/operator of the facility where the lift service is performed. The LSP may provide their own LDE and/or operators, or task supporting organizations or contractors to provide LDE and/or operators. The LSP shall be responsible for the following:

a. Verifying that LDE operators and supporting personnel are properly designated, authorized, trained, and certified (see GPR 8719.1) at the time lifting operations are performed;
b. Verifying that lift procedures and checklists, when needed (see Section 3.1), are available and understood for lifting operations;

c. Verifying that deficient LDE or other lifting equipment that is removed from service is locked out or tagged out-of-service, and that RECERT is promptly notified;
d. Coordinating outages for load testing and inspections of lifting devices with RECERT to minimize conflicts with ongoing operations;
e. Providing lifting devices and/or lifting equipment, when requested by the Lifting Service User, appropriate for the lifting operation, i.e., certified for critical (and non-critical) lifts, or certified for non-critical lifts only;
f. Notifying the Facility Operations Manager (FOM) of any operations that may have unusual hazards or safety implications (see 1.11); and
g. Safe conduct of all lifting operations.

For **Critical Lifts**, the LSP shall also:

h. Provide expert advice and assistance on lifting operations;
i. Support the User in developing the Critical Lift Procedure(s) for User equipment;
j. Support the User in developing variance requests, when required;
k. Verify that all required LDE and associated tools are available, in correct operating condition, and certified as required;
l. Review and verify lift and critical lift procedures with the User prior to the lift operation; and
m. Certify, to the User, that all above requirements have been met prior to the lift operation.

1.2 Lifting Service User

The Lifting Service User (hereinafter referred to as "User") is the Program or Project Manager or their Representative that is the owner of the hardware being lifted or handled. The User is ultimately responsible for their hardware, and therefore has key responsibilities in the lifting operations. Users shall coordinate closely with the LSP for the conduct of lifting operations that affect their hardware.

Many Users are flight projects that use special lifting devices or fixtures and require specialized engineering support. They may provide their own lifting equipment and/or operators, or task supporting organizations or contractors to provide equipment and/or operators.

Users shall be responsible for the following for all lifting operations of their hardware:

a. Providing input to the RECERT Manager to identify the category of lifts for their hardware, i.e., critical or non-critical, so that compliance requirements for lifting operations can be established. Appendix C "Process for Lifting Category Determination" shall be used for this determination and input shall be obtained from the LSP, the applicable safety organization(s), and facility personnel (if appropriate);
b. Selecting LDE for a lift based upon the maximum load it would experience in the worst case scenario during the lift;
c. Developing or verifying availability of lifting procedures and HOPs that address the safety of their personnel and hardware (see Section 3.1). For lifting or handling equipment not covered by NASA-

STD-8719.9, consult and follow the equipment manufacturers' recommendations with documented concurrence from the applicable safety representative;

d. Designating a Person In Charge with the responsibilities described in 1.4 below;
e. Developing and approving Critical Lift Procedure(s) prior to beginning lift operations, and concurring with changes during the lift;
f. Verifying that the LSP's LDE and operators have current certifications as required by GPR 8719.1 for the type of lifting operations required;
g. Verifying that all applicable safety analyses (e.g., stability analysis, lift analysis, etc.) or assessments are completed and are sufficient per the requirements of NASA-STD-8719.9, and that lift points are above the established Center of Gravity (CG);
h. Initiating a Waiver/Variance request if any NASA or GSFC safety requirements are not met, in accordance with NPR 8715.3 or GPR 1400.1 as applicable;
i. Providing engineering support as needed by the LSP for User hardware;
j. Providing for appropriate Safety Representative support as described in Section 1.5;
k. Providing Work Order Authorization(s) (WOAs) as required by GPR 5330.1;
l. Notifying the FOM of any operations that may have unusual hazards or safety implications (see 1.11);
m. Stopping lifting operations in the event of an actual or reported failure or unsafe condition;
n. Providing concurrence to resume operations once failures or unsafe conditions are corrected;
o. Determining the applicability of NASA-STD-8719.9 and this procedure to off-site contractors, and ensure that sufficient requirements are invoked in the contracts; and
p. The safe conduct of all lifting operations.

1.3 Person In Charge (PIC)

The PIC shall take overall responsibility for the conduct of the lifting operation. The PIC shall be from the User organization or the LSP, and may be an I&T Manager, Lead Engineer, LDE Operator, the Rigger, a Critical Lift Coordinator (CLC), supervisor, or any other individual selected and specified in the critical lift or other applicable procedure. The PIC shall:

a. Verify that all involved parties meet the lift requirements;
b. Verify that all tools and equipment are adequate for the lift requirements;
c. Fill out Appendix C "Process for Lifting Category Determination";
d. For any critical lift, or for any lift determined by the LSP or User to need a pre-lift briefing and walk-through, conduct a pre-lift briefing/walk-through with all required participants. See Section 2.3;
e. Verify that adequate communications and direction are available, particularly for the LDE operator(s); and
f. Manage the lifting operation.

1.4 Safety Representative(s)

The qualified safety representative(s) shall be responsible for the following:

a. Maintaining qualification in terms of competence, experience, training, etc.;

b. Verifying that all applicable safety analyses or assessments are completed in accordance with requirements of NASA-STD-8719.9;
c. Advising all personnel involved in the lifting operations of any additional hazard(s) and appropriate methods of hazard control prior to and throughout the entire lifting operation;
d. Verifying that Incident/Mishap Reports are initiated and submitted in accordance with this document and the requirements of GPR 8621.1;
e. Providing input to the User organization to identify the lifting operations as critical or non-critical;
f. Reviewing and approving all critical lift procedures, HOPs, and WOAs pertaining to critical lifting operations;
g. Ensuring appropriate hazard controls have been addressed in the HOPs and/or WOAs;
h. Ensuring that the lifting operation adheres to this directive and all applicable NASA, Occupational Safety and Health Administration (OSHA), and processing facility safety regulations (where appropriate);
i. Providing concurrence to proceed with a hazardous lifting operation and, upon completion, concurrence to open the controlled area and resume normal operations; and
j. Reviewing and concurring with/denying project-initiated safety waiver/variance requests (see NPR 8715.3 or GPR 1400.1) prior to submittal to the RECERT Manager.

1.5 Lift Team Members

Lift team members shall:

a. Participate in Pre-Lift Briefings as described in Section 2.3;
b. Understand their roles and the roles of other lift team members for a given operation;
c. Ensure that they fully understand all applicable procedures and safety requirements; and
d. Wear the appropriate Personal Protective Equipment (PPE).

1.6 Office of System Safety and Mission Assurance at Greenbelt and the Safety Office at Wallops

The Office of System Safety and Mission Assurance at Greenbelt and the Safety Office at Wallops shall:

a. Audit executed lift procedures and associated documentation as specified in Section P.9;
b. Concur with/deny Waiver/Variance requests submitted; and
c. Concur with/deny selected Safety Representative.

1.7 Safety and Environmental Division at Greenbelt and the Safety Office at Wallops

The Safety and Environmental Division at Greenbelt and the Safety Office at Wallops shall:

a. Provide oversight for Center industrial or institutional lifting operations for compliance with GSFC, NASA, and OSHA requirements;
b. Monitor compliance of institutional lifting operations and operators to the requirements herein;
c. Monitor compliance to institutional safety requirements;

d. Audit executed lift procedures and associated documentation as specified in Section P.9;
e. Concur with/deny Waiver/Variance requests submitted; and
f. Concur with/deny selected Safety Representative.

1.8 RECERT Manager

The RECERT Manager shall, in addition to the responsibilities described in GPR 8719.1, be responsible for:

a. All RECERT functions described herein;
b. Reviewing results of executed lift procedure audits by the safety offices, and implementing appropriate follow-up actions as required by Section P.9;
c. Reviewing and concurring or denying safety waiver/variance requests prior to the originator's submittal to other appropriate authorities and Center Director for approval; and
d. Receiving input from facility, program, user, and safety assurance personnel regarding the lifting operation to identify the category of a lift as either critical or non-critical.

1.9 Deputy RECERT Manager.

The Deputy RECERT Manager shall serve as the RECERT Manager's alternate and represent the RECERT Manager at WFF for day-to-day operations by performing the duties in Section 1.9.

1.10 Building Facility Operations Manager (FOM).

FOMs are responsible for notifying building occupants of potential safety hazards in and around facilities under their cognizance. When notified by the LSP or User of a lifting operation with unusual hazards or safety implications (i.e., potential to affect occupants beyond the immediate lift area), he/she shall review the proposed lifting operation(s) and concur prior to commencing the lifting operation(s).

1.11 Certified Critical Lift Coordinator (CLC).

CLCs shall be responsible for:

a. Maintaining a current certification as required by GPR 8719.1;
b. Coordinating the preparation and execution of the lift(s) with the PIC; and
c. When indicated in the Critical Lift Procedure, directing and commanding the lifting operation for their organization's hardware.

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2.0 REQUIREMENTS

2.1 General Requirements for All Lifting Operations

2.1.1 Prior to any lifting operation:

a. The LDE operator shall:

(1) Inspect all LDE in accordance with NASA-STD-8719.9, manufacturers recommendations, and GSFC procedures;
(2) Verify appropriate PPE (e.g., hard hats, eye protection, etc.) are available and used properly; and
(3) Verify the load's weight and the location of the CG.

b. The PIC shall:

(1) Analyze the lift for all unmitigated hazards, including lift stability. For non-hazardous mechanical lifts, a Job Hazards Analysis or checklist may be used to document hazards in lieu of a lift stability analysis; GSFC Form 23-60 may be used to satisfy this requirement. For routine hazardous lifts, a one-time analysis can be done where risk mitigation controls are written into a standard procedure for the operation;
(2) Verify that the operational requirements for the type of lifting devices and/or equipment being used comply with NASA-STD-8719.9;
(3) Verify that all LDE are certified as described in GPR 8719.1 for the category of lift to be performed; and
(4) Verify that all operators and riggers involved in the lift are certified for the category of lift to be performed.

2.1.2 Suspended load operations

Suspended load operations, as defined in NASA-STD-8719.9, are discouraged at GSFC. However, if a suspended load operation cannot be avoided, the operation shall comply with NASA-STD-8719.9, Appendix A, "NASA Alternate Standard for Suspended Load Operations." Prior to any suspended load operation, the User shall prepare analysis documentation of the operation (see NASA-STD-8719.9) and submit it to the RECERT Manager for concurrence. The RECERT Manager shall, in turn, consult with the NASA HQ Office of Safety and Mission Assurance per HQ requirements.

2.1.3 Loads Containing Components Sensitive to Electrostatic Discharge (ESD)

The User shall be responsible for ESD protection of the load. The User shall address and coordinate ESD protection with the LSP to ensure that the ESD requirements of the load are fully understood and protective measures are taken. If special handling requirements are needed to ensure ESD protection, they shall be addressed in documented procedures (see Section 3.1). Procedures shall address and comply with the requirements of NASA-STD-8719.9 and GSFC WM-001.

2.1.4 Loads Containing Explosives or Electro-Explosive Devices (EEDs)

The User shall be responsible for all lifting operations involving loads containing explosives or EEDs. Such lifts shall be classified as critical unless a documented risk assessment is performed that indicates otherwise and is concurred by responsible user management and the applicable safety representative. If it is indicated as non-critical, it shall be classified as hazardous.

2.1.5 Loads Containing Pressurized Containers

The User shall be responsible for all lifting operations involving loads containing pressurized containers which do not conform to the Department of Transportation (DOT) or the American Society of Mechanical Engineers (ASME) requirements. Such lifts shall be classified as critical unless a documented risk assessment is performed that indicates otherwise and is concurred to by responsible user management and the applicable safety representative. If it is indicated as non-critical and the pressure containers do not conform to DOT or ASME requirements, it shall be classified as hazardous.

2.1.6 Loads Containing Hazardous Materials

The User shall be responsible for all lifting operations involving loads containing hazardous materials which are contained in containers which do not conform to DOT or ASME requirements or the hazardous material has been removed from the Original Equipment Manufacturer's (OEM) packaging. Such lifts shall be classified as critical unless a documented risk assessment is performed that indicates otherwise and is concurred to by responsible user management and the applicable safety representative. If it is indicated as non-critical and the containers do not conform to DOT or ASME requirements, or if the hazardous material has been removed from the OEM packaging, it shall be classified as hazardous.

2.1.7 Hazardous Lifting Operations

The User shall be responsible for all hazardous lifting operations. Hazardous lifting operations shall be conducted in accordance with the requirements of sections 3.8 and 7.4 of NPR 8715.3A.

2.1.9 Use of Hard Hats

In accordance with OSHA 1910.135 (a)(1), hard hats shall be worn when working in areas where there is a potential for injury to the head from falling objects. However, the use of hard hats may introduce risk of damage to the load from contact with a hard hat. The PIC shall examine each situation and ensure steps (e.g., chin straps or tethering) are taken to mitigate the risk.

2.2 Special Requirements for Critical Lifts

The requirements for critical lifts detailed in NASA-STD 8719.9 shall be followed in their entirety and Appendix C "Process for Lifting Category Determination" shall have been completed. The following specific requirements apply, whether the critical lift is project equipment or otherwise:

a. Prior to any critical lifting operations, the PIC shall:
   1) Verify that the LE is certified per GPR 8719.1 for critical lifts.
   2) Verify the weight and CG location to ensure that the payload maintains stability during the lift.
   3) Verify that the Critical Lift Procedures, including any required waivers/variances, are complete and approved as described in Section 3 herein.

4) Perform a pre-lift briefing (see Section 2.3 of the lift team) including the User's designated representatives, Safety Representatives, and others as appropriate to review the planned lifting operation.

b. The lifting procedure shall contain a tabulation of LDE, including slings, hoist rings, shackles, turnbuckles, spreader bars, lifting assemblies, Hydra Set, load-measuring devices, and any other hardware components used in the lifting operation. The following information shall be provided for each item attached in the load line: safe working load (SWL), expiration date, and RECERT control number;

c. Videotaping of the Critical Lift shall be the User's responsibility. Videotaping is encouraged but not mandatory;

d. A single person (NASA or contractor) shall be designated as responsible for the safety of the operation. This shall be the Safety Representative described in Section 1.5;

e. A Critical Lift shall not commence unless all team members required by the Critical Lift Procedure are present, on station, and have received the pre-lift briefing;

f. When so designated in the Critical Lift Procedure, CLCs shall be responsible for directing and giving commands to the LDE Operator during a lifting operation and;

(1) The CLC shall instruct all personnel involved in the proper preparation, lifting, and final positioning to be achieved, as a part of the pre-lift briefing.
(2) Coordination for directing the lifting operation shall be delineated in the Critical Lift Procedure and emphasized in the pre-lift briefing.
(3) Any transfer of responsibility for directing the lifting operation (e.g., from CLC to the rigger/crane operator or vice versa) shall be identified in the Critical Lift Procedure and emphasized in the pre-lift briefing.
(4) A CLC shall not perform rigging activities or hands-on operation of lifting devices.

Appendix A of this directive is a sample checklist for critical lifts.

2.3 Requirements for a Pre-Lift Briefing

A pre-lift briefing shall be performed whenever more than one person is involved in the activity, whenever a lift is considered critical, or whenever the PIC, a Safety Representative, or a supervisor in the LSP or User organization requests one. In these cases, the briefing shall be conducted, regardless of familiarization or experience of those performing the task or operation. The pre-lift briefing is generally useful for all but the most routine operations, and is primarily aimed at ensuring the safety and coordination of the personnel and equipment involved.

2.3.1 The PIC normally conducts the pre-lift briefing, although they may delegate this responsibility.

2.3.2 The pre-lift briefing shall be conducted prior to beginning lifting operations, and shall involve all personnel having a role in the operation. When Lift Team members arrive after the lift has begun, such as when a shift change occurs, the incoming personnel shall be sufficiently briefed to ensure that they fully understand their roles, the task(s) to be performed, and all relevant elements of the pre-lift briefing.

2.3.3 Prior to the Pre-Lift Briefing, the briefer shall:

a. Check weather forecast and/or storm code panel for adverse conditions that could potentially affect the lift;
b. Check LDE for proper criticality category and certification;
c. Check LDE log book(s) to verify that there are no outstanding deficiencies;
d. Verify that required lift procedures and WOAs have been approved and signed off with all required signatures;
e. Verify that any required lift stability analyses, HOPs, stress analyses, etc., are completed and available;
f. Verify that the CG and total weight of the load to be lifted are known and documented; and
g. Verify that all 2-way radios to be used during lifting operations are fully charged, functioning properly, and do not produce radio interference with other equipment in the vicinity.

2.3.4 At the Pre-Lift Briefing, the briefer shall:

a. Verify that all Lift Team members are present;
b. Verify that all Lift Team members understand their roles and responsibilities;
c. Perform a step-by-step review of the lifting operation;
d. Explain the hardware to be lifted, associated Ground Support Equipment, configuration of lifting equipment, and associated hazards;
e. Verify that all Lift Team members understand the PPE requirements and are prepared to meet them;
f. Review any applicable safety requirements or procedures; and
g. Emphasize that safety is the primary consideration during the lift.

2.4 Institutional Lifts

Institutional lifts are those lifts performed frequently and repetitively, often on a daily basis, and normally involve activities such as construction or maintenance, handling of shop materials, and other routine activities involved in the normal operation of the Center. In general, the LDE consists of cranes, forklifts, powered pallet jacks, and other material-handling equipment.

Supervisors shall require that LDE operators that perform institutional lifts are trained in the safe operation of the LDE in use, and certified or otherwise qualified as defined in GPR 8719.1. Supervisors shall also confirm that any special procedures necessary to protect personnel or high-value equipment are available and understood by operators.

If an institutional lift is determined to be a Critical Lift, Section 2.2 shall apply.

2.5 Manual Lifts

This section applies to those cases where one or more individuals manually supports or moves an object, with or without LDE. Manual lifts of small, lightweight critical items, such as circuit board panels, do not require all the safeguards described below. Other requirements may be determined by the supervisor

or project manager. In such cases, supervisors or project managers shall be responsible to ensure that there is no compromise of safety to the personnel or equipment.

Manual lifts may range in complexity from handling a lightweight item of equipment to supporting an item of space flight hardware while LDE is repositioned. Operations as simple as helping someone move an item of office equipment are considered manual lifts.

2.5.1 The following safe lifting and handling load limits shall apply for each manual **critical** lift:

a. 35 lbs of manageable shape and size for one person;
b. 75 lbs of manageable shape and size for two people;
c. 100 lbs of manageable shape and size for three people;
d. No manual lift shall be performed for a load exceeding 100 lbs unless written concurrence from a qualified safety representative has been obtained; and
e. All lifts shall be within limits of comfortable balance and control.

Supervisors shall determine and document weight limits for manual **non-critical** lifts. In making this determination, supervisors shall consider the guidelines of DHHS (NIOSH) Publication No. 94-110, Applications Manual for the Revised NIOSH Lifting Equation.

2.5.2 The following rules shall apply whenever performing a manual lift. These rules may be tailored based on the situation, but shall not compromise personnel or equipment safety or permit undue risk.

a. Plan and walk through the entire lift prior to commencing the lifting operation;
b. Visually inspect the area to identify any tripping hazards and remove them, if possible, prior to starting. If a trip hazard cannot be moved prior to starting, a spotter shall be used to guide the individual(s) performing the lift when approaching the hazard;
c. Clear work area and translation path of personnel not involved in the lifting operation;
d. Pick up the load correctly to avoid injury. Minimize unnecessary bending, twisting, and lifting above the shoulders;
e. Make use of mechanical devices such as portable carts or dollies whenever possible. Inspect carts and dollies for any damage before use, and verify the device has a suitable load rating for the item to be moved;
f. Ensure that the item being lifted can be handled manually without injury to personnel or damage to the hardware and/or facility;
g. Ensure that a firm grip can be maintained from the beginning to the end of the lift;
h. Ensure that the load destination is clear of obstacles and provides a stable base to support the load;
i. When in doubt, STOP! Contact the appropriate safety representative or safety organization.

2.5.3 If a manual lift is considered complex, and high-value equipment and/or safety are at risk, a procedure and/or WOA shall be written and followed as required in Section 3. If the manual lift is considered a Critical Lift, Quality Assurance (QA) witnessing is required, but Safety witnessing is not. Manual lifts of small, lightweight critical items, such as circuit board panels, do not require QA or Safety witnessing.

2.6 Special Requirements for Off Load Operations with Constraints (OLOCs)

OLOCs (see Definitions P.10.p) present additional hazards to personnel and hardware and shall only be conducted when it is not possible to perform the same activity in a conventional, unconstrained manner. OLOCs shall be treated as critical lifts and shall comply with Section 2.2.

Since an OLOC is an unusual lift operation and poses additional risks to the hardware or item being handled, the Project Manager must assess, acknowledge and accept these risks before the operation is performed. A copy of this risk assessment shall be sent to the RECERT Manager for information purposes prior to performance of the OLOC.

An example of an OLOC (see Definitions P.10.p) would be off-loading the weight of a piece of hardware attached to a handling/holding fixture (i.e., constrained) prior to releasing the attachment fasteners. An OLOC must be treated as a critical lift and the total combined weight of the hardware handling/holding fixture, the hardware lifting equipment, and the hardware must be within the SWL of the LD (i.e., the crane or other facility equipment).

The following are additional requirements that shall apply to OLOCs to minimize the potential of hardware damage and/or exceeding the SWL of any LE or hardware component in the load path during the operation.

2.6.1 Two independent devices are required to measure the load and shall be monitored at all times by a member of the lift team other than the crane operator.

2.6.2 Crane hoist speed is absolutely critical for safe execution of the OLOC and must be able to be limited to .75 inches/minute. Thus cranes used for OLOC operations shall be equipped with a momentary ON button that controls the Constant Micro Speed (CMS) to this limit.

2.6.3 If proper CMS control is not available a Hydra Set shall be used for hoist operations. The User must be aware of potential Hydra Set issues such as hook height limitations, the lack of load release incremental control, and hydraulic fluid leaks.

2.6.4 If proper CMS control is not available and a Hydra Set cannot be used, the OLOC shall be engineered to provide another path to success – such as highly compliant LDE – and approached with extreme caution. Otherwise the OLOC must be abandoned.

2.6.5 Load measurement instrumentation configuration shall be documented in the procedure, including settings and a diagram of connections.

2.6.6 All equipment shall be used within the manufacture’s specifications.

2.6.7 Personnel setting up, using, and monitoring the load measuring devices and Hydra Set shall be trained in the operation, use, and limitations of the equipment and shall be present during the operation.

2.6.8 Pre-Operation Checks

a. Perform an accuracy verification check on the load measuring devices within 24 hours of the lift by lifting a known weight.

b. Verify all settings and equipment configurations comply with the procedure.

c. Perform a load test verification check on the Hydra Set within 24 hours of the lift by lifting a known weight.

3. DOCUMENTATION REQUIREMENTS

3.1 Required Procedures

Documented procedures shall be prepared, when required, for lifting operations as defined below. Procedures shall not rely on personnel to stabilize or support any portion of a load that exceeds the manual lift limits in 2.5.1, even in conjunction with LDE.

a. Work Order Authorizations shall be processed and approved for project lifts as defined in GPR 5330.1.

b. Procedures for routine, non-critical lifts shall be available and may be generic and not lift-specific. The requirement may be satisfied by adherence to overall standards, generic lifting procedures, standard operating procedures, and/or original equipment manufacturer's operating instructions, augmented by operator training and certification.

c. Procedures for non-routine, non-critical lifts, such as a lift involving an unusually configured load with an off-center CG, shall require a stress/stability analysis and lift procedure prior to commencement of the lifting operation(s). The PIC shall determine the degree of detail and approvals required. Normally, these procedures may be similar to those described in 3.1.b, with additional detail added for non-routine situations.

d. HOPs shall be required for all operations involving unusual hazards. HOPs may be stand-alone or incorporated in the body of other procedures. HOPs shall comply with the requirements of NPR 8715.3.

e. Checklists are very effective, and their use is encouraged to supplement required procedures. Checklists for key items of LDE can reduce the work involved in producing procedures. A sample checklist for a critical lifting operation is given in Appendix A. A sample checklist for a non-critical lifting operation is given in Appendix B. Other checklists should list detailed steps in the operation. Appendix C "Process for Lifting Category Determination" is required when a decision concerning whether or not a lift is critical is to be made.

f. Institutional lift procedures are usually as described in 3.1.b and 3.1.c. Supervisors shall ensure that adequate procedures are available, and shall produce a lifting procedure and perform a pre-lift briefing for lifts having an unusual level of risk.

g. Critical Lift Procedures shall be developed for each critical lifting operation, except as provided in 2.5.

h. Waiver/variance Documentation shall be prepared and approved in accordance with GPR 1400.1 and NPR 8715.3.

The following table serves as a guideline for determining the need for lift procedures.

Criticality	Type	Description	Lift Procedure Needed?
Non-Critical	LDE	Simple or routine	No
Non-Critical	LDE	Non-routine or complex	Yes
Non-Critical	LDE	Institutional with no risks except those inherent in any lifting operation	No
Non-Critical	LDE	Institutional with risks in addition to those inherent in any lifting operation	Yes
Non-Critical	Manual	Simple	No
Non-Critical	Manual	Complex	Yes
Non-Critical	Manual	High dollar	Yes
Non-Critical	Manual	Safety risk	Yes
Critical	All	All (see 3.1.g)	Yes

3.2 Non-Critical Lift Procedures

Procedures, when required (see Section 3.1), shall be available for all LDE citing general operating instructions, operator certification or training requirements, equipment certification requirements, and other information needed to ensure safe performance of lifting operations. Procedures may be generic, and may apply to multiple types of lifts for a given facility or LDE. These procedures need not be lift-specific. They should be sufficient to ensure safe handling of lifted and lifting equipment, ensure operator safety, and minimize or eliminate risk (Ref: NASA-STD-8719.9).

3.3 Critical Lift Procedures

Critical Lift Procedures are the responsibility of the User. As a minimum, the Critical Lift Procedure shall be reviewed and approved by the LSP, User, Safety Representative, and the PIC before the lifting operation. The procedures shall address the following:

a. Description of the lift operation, location, and LDE to be used, including defining the safety keep-out zone for the operation;
b. Identification of lift team members, their roles, and responsibilities;
c. Degree and makeup of safety and mission assurance coverage;
d. Sequential operational requirements;
e. HOPs;
f. Checklists and other required documents;

g. Emergency and contingency procedures (e.g., fire, power outage, lifting during an electrical storm, outdoor lifts under windy conditions, etc.);
h. Special requirements for ESD, EEDs, and explosives;
i. PPE;
j. Contamination control requirements;
k. Stability analyses, stress analyses, variance(s) (if required), and any other analyses determined by the LSP or User to be needed before the lift;
l. Procedures for making and approving changes to the procedure after it has been approved;
m. Description of the means of communications to be used; and
n. Photo or videotape requirements.

3.4 Waiver/Variance Documentation

Safety waiver/variance Documentation, if needed, shall be prepared and approved in accordance with GPR 1400.1 and NPR 8715.3.

APPENDIX A
SAMPLE CHECKLIST
FOR CRITICAL LIFTING OPERATIONS

- ☐ 1. All Lift Team members are present.
- ☐ 2. The Lift Stability Analysis, Stress Analysis, and other required documentation are completed.
- ☐ 3. The Lift Procedure has been approved and has all required signatures.
- ☐ 4. The CG and total weight of load to be lifted are known and documented.
- ☐ 5. If 2-way radios are to be used, all units are fully charged, functioning properly, and do not produce radio interference with other equipment in the vicinity.
- ☐ 6. All team members are wearing appropriate PPE.
- ☐ 7. Weather forecast and/or storm code panel (if applicable) are checked for adverse conditions that could potentially affect the Lift.
- ☐ 8. LDE is certified for critical lifts.
- ☐ 9. The LDE Operator is certified for Critical Lifting.
- ☐ 10. The LDE Log Book indicates no outstanding deficiencies.
- ☐ 11. Conduct a Pre-Lift Briefing

_____ _____

Signed by: Date

NOTE:

This is an example only. Developing custom checklists for lifts is encouraged because checklists aid in the planning process, they document that individual steps are taken, and they eliminate the possibility of omitting steps by mistake.

APPENDIX B
SAMPLE CHECKLIST
FOR NON-CRITICAL LIFTING OPERATIONS

☐ Determine whether the lift is simple or complex.

a. If the lift is simple and routine, the lift may be performed following industrial standards and practices, general guidelines, and operator training.

b. If the lift is complex and/or involves an unusual load configuration with an off-center CG, the PIC shall require that a stress/stability analysis and a lift procedure be developed and approved prior to the lifting operations. Also confirm the following, as appropriate:

☐ All Lift Team members are present.
☐ The Lift Procedure has been approved and signed off for all signature blocks.
☐ The required stress/stability analysis is completed.
☐ The CG and total weight of load are known and documented
☐ If 2-way radios are to be used, all units are fully charged, functioning properly, and do not produce radio interference with other equipment in the vicinity.
☐ Ensure that all Team members are wearing appropriate PPE.
☐ Check weather forecast and/or storm code panel (if applicable) for adverse conditions that could potentially affect the Lift.

☐ Check LDE for valid certification.
☐ Check LDE Log Book to ensure that there are no outstanding deficiencies.
☐ Verify that the LDE operator's certification is valid.

_____ _____

Signed by: Date

NOTE:

This is an example only. Developing custom checklists for lifts is encouraged because checklists aid in the planning process, they document that individual steps are taken, and they eliminate the possibility of omitting steps by mistake.

APPENDIX C

PROCESS
FOR LIFTING CATEGORY DETERMINATION (See Note 1)

PIC:
Date:
Project:
Organization:
Description of Lift:

For the Lift in Question	YES**
1. Will LDE failure/loss of control result in serious personnel injury or loss of life?	
2. Will LDE failure/loss of control result in damage or loss of program-critical flight hardware?	
3. Will LDE failure/loss of control result in damage or loss of one-of-a-kind articles?	
4. Will LDE failure/loss of control result in damage or loss of major facility components which will have serious institutional or programmatic impact?	
5. Will LDE failure/loss of control result in damage or loss of any article that could have serious programmatic or institutional impact?	
6. Are personnel being lifted with a crane? (see NASA-STD-8719.9, App. C & ASME B30.23)	
7. Are personnel required to work under a suspended load? (see NASA-STD-8719.9, App. A)	
8. Does the load contain explosives or EEDs ? (see 2.1.4 for exceptions)	
9. Does the load contain pressurized containers? (see 2.1.5 for exceptions)	
10. Does the load contain hazardous materials? (see 2.1.6 for exceptions)	
11. Is the lift an OLOC? (see 2.6 for explanation) – See Note 2.	
12. Are there any other personnel or equipment safety concerns that could be considered out of the ordinary?	

** If the answer to any of the questions listed above is “YES”, the Lifting Operation must be declared a Critical Lift.

Concurrence: Program/Project Manager

Safety/Facilities Manager

Notes:
1. A signed copy of Appendix C shall be sent to the RECERT Manager.
2. A signed copy of the OLOC Risk Assessment shall be sent to the RECERT Manager.

CHANGE HISTORY LOG

Revision	Effective Date	Description of Changes
Baseline	8/8/2006	Initial Release
A	2/4/2008	Added new requirements for off-load operations with constraints, NASA document designation updates, variance processing, and other changes throughout for clarification. In P.2, clarified Applicability for contractors.
B	9/29/2009	Added Appendix C – Process for Lifting Category Determination, modified OLOC definition (P.10) and requirements (2.6), and other changes throughout for clarification.